4.0 WASTE INVESTIGATION

4.1 PURPOSE AND SCOPE

The waste investigation was conducted at the Schwerman Trucking (ST) site, the Chattanooga Creek Tar Deposit site, and the Landes Property in order characterize the nature of the wastes at those sites. At the ST site, one waste sample was collected from each of the three mounds as shown on **Figure 4-1**. All three samples were analyzed for TCL and TAL constituents by a CLP laboratory. One sample was also analyzed for dioxins and furans by a CLP laboratory. At the CCTD site, one sample of tar-like waste material was collected from within the fenced area. This sample was analyzed for TCL and TAL constituents, and dioxins and furans by a CLP Laboratory.

4.2 METHODS

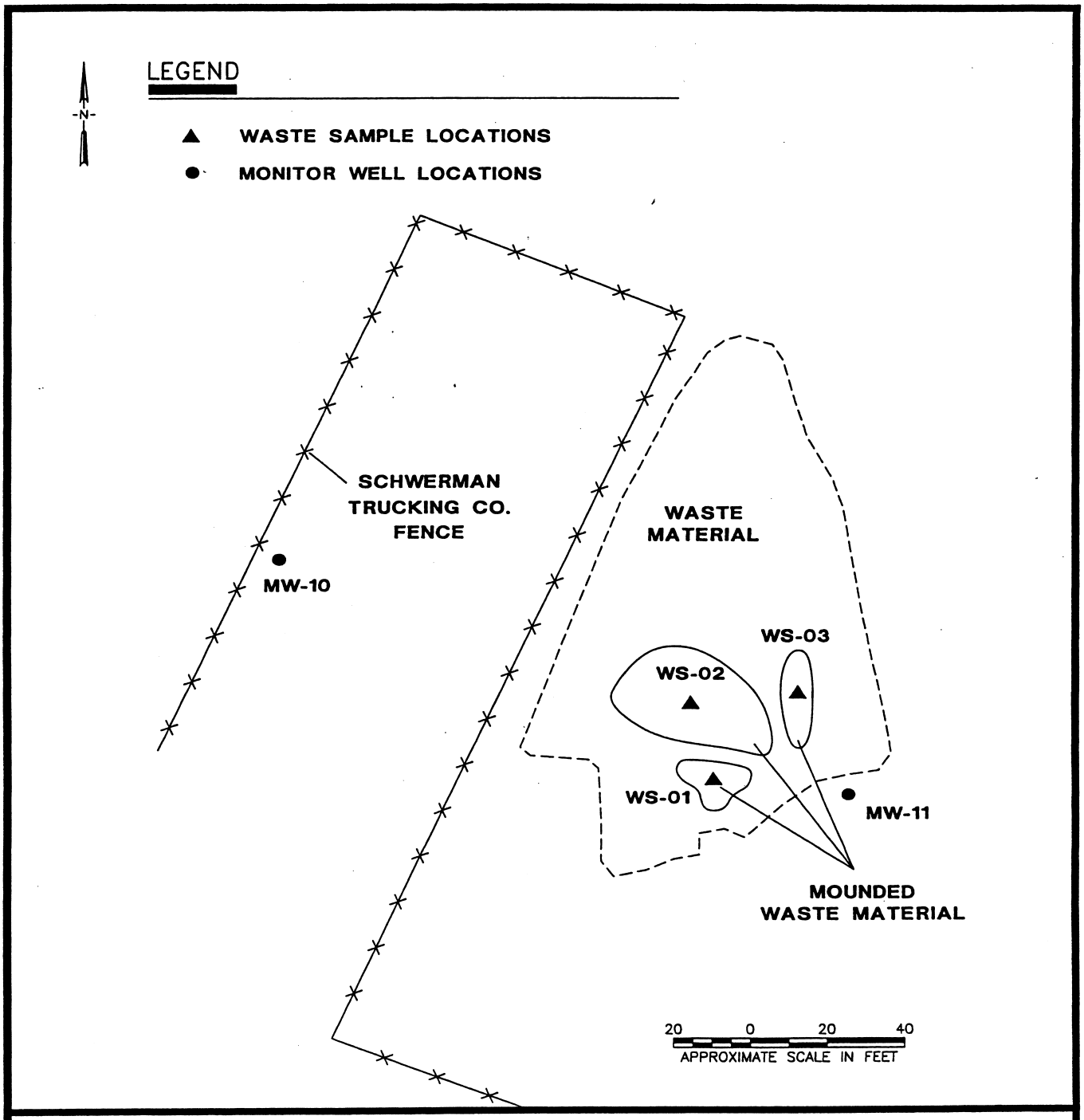
The procedures for waste sampling and decontaminating the equipment are described in detail in the *Final Work Plan* (CDM Federal, 1995) for the Tennessee Products Site RI/FS.

4.3 SUMMARY

4.3.1 SCHWERMAN TRUCKING (ST) SITE

Organic Constituent Contamination

No volatile or semivolatile organic compounds were detected in the waste samples from ST Site. The absence of PAHs in these waste samples indicate that this waste material is not coal tar. The only organic constituents detected in any of the samples from ST Site were four dioxin/furan compounds. These analytical results are summarized on **Table 4-1** (note that the table only lists



WASTE SAMPLING LOCATIONS

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Tennessee Products Site
Chattanooga, Tennessee

FIGURE No. 4-1

dump2/6JUL96/160

TABLE 4-1

WASTE SAMPLING SUMMARY - DIOXINS/FURANS
SCHWERMAN TRUCKING SITE
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	SAMPLE ID: WM-03
DIOXINS/FURANS	
1,2,3,4,6,7,8 HEPTACHLORODIBENZODIOXIN	***14***
HEPTACHLORODIBENZODIOXIN (TOTAL)	***19J***
1,2,3,4,6,7,8 HEPTACHLORODIBENZOFURAN	***2.3J***
HEPTACHLORODIBENZOFURAN (TOTAL)	***2.7J***
TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89)	***0.16***

Data Qualifiers:

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate. The value preceding the "J" is the estimated value.

Concentrations presented in ng/kg. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

those constituents that were detected in at least one sample). These compounds have a toxic equivalent value (TEQ) of 0.16 ng/kg. The TEQ is calculated to normalize the toxicity of the detected dioxin-like compounds to the toxicity of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), the most widely studied and most toxic of the dioxins. Each dioxin-like compound is assigned a toxic equivalence factor (TEF) as defined in *Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs) and 1989 Update* (EPA, 1989c). The TEQ is the sum of the concentrations of the dioxin-like compounds multiplied by their respective TEFs. A TEQ of 0.16 ng/kg is well below the EPA clean-up goal of 1 ug/kg for soils in residential areas (OSWER, 1998).

Metals Contamination

In order to determine which inorganic constituents are present in the waste at concentrations exceeding naturally occurring concentrations, the analytical data from the waste samples were compared to background criteria for surface soil. Surface soil criteria were selected for comparison to waste because the waste is present at ground surface. As shown in **Table 4-2**, four metals (nickel, mercury, cobalt and sodium) were detected at concentrations exceeding the background criteria for surface soil (see Section 5.3.1 for a description of the calculation of the 95% confidence level for background concentrations of metals in surface soil). Most notable is the concentration of nickel which was detected in all three waste samples at concentrations ranging from ten to eighteen times that of the background surface soil criteria. A concentration of mercury exceeding background concentrations was detected in only one sample and excessive concentrations of sodium were detected in two samples.

4.3.2 CHATTANOOGA CREEK TAR DEPOSIT (CCTD)

The analytical results of the waste sample collected from the CCTD (WS-04), are summarized in **Tables 4-3, 4-4 and 4-5**. The sample contained five volatile aromatic hydrocarbons: benzene, toluene, chlorobenzene, ethylbenzene, and total xylene. Eighteen PAHs were detected in the

TABLE 4-2

WASTE SAMPLING SUMMARY - INORGANICS
SCHWERMAN TRUCKING SITE
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL / SAMPLE ID:	WM-01	WM-02	WM-03
BARIUM	26J	65J	49J
COBALT	***1.7J***	***2.4J***	2U
CHROMIUM	1.5J	2U	2U
COPPER	2U	1.2J	1U
NICKEL	***460***	***490***	***260***
LEAD	13J	12J	4.1J
VANADIUM	5J	7.4J	9.3
ZINC	20	12	16
MERCURY	0.04	***0.27***	0.04U
ALUMINUM	12000J	17000J	23000J
MANGANESE	18	36	30
CALCIUM	1100J	1200J	1400J
IRON	6200J	8000J	8700J
MAGNESIUM	1900	3000	3900
SODIUM	73	***170***	***85***
POTASSIUM	270	250J	340
CYANIDE	0.05UJ	0.07J	0.05UJ

Data Qualifiers:

U=The chemical was analyzed for but not detected. The value preceding the "U" is the minimum quantitation limit.

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate. The value preceding the "J" is the estimated value.

UJ=The chemical was analyzed for but was not detected. The value is the estimated quantitation limit.

Concentrations presented in mg/kg. Concentrations printed in bold italicized text are considered to be valid detections of unnatural contamination.

TABLE 4-3

WASTE SAMPLING SUMMARY - ORGANICS
CHATTANOOGA CREEK TAR DEPOSIT
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

SAMPLE ID: / CHEMICAL	WS-04	WS-04 (dup)
VOLATILE ORGANICS		
BENZENE	***17***	***17***
TOLUENE	***120***	***120***
CHLOROBENZENE	***39***	***46***
ETHYL BENZENE	***14***	***13***
TOTAL XYLENES	***130***	***140***
SEMIVOLATILE ORGANICS		
NAPHTHALENE	***4500***	***2900***
ACENAPHTHYLENE	***400***	***340J***
ACENAPHTHENE	***2200***	***930***
FLUORENE	***2500***	***1200***
PHENANTHRENE	***5300***	***3000***
ANTHRACENE	***2200***	***1100***
FLUORANTHENE	***4200***	***2200***
PYRENE	***3000***	***1400***
BENZO(A)ANTHRACENE	***1600***	***670***
CHRYSENE	***1600***	570
BENZO(B &/OR K)FLUORANTHENE	***2000***	800
BENZO-A-PYRENE	***1200***	460
INDENO (1,2,3-CD) PYRENE	***500***	***210J***
DIBENZO(A,H)ANTHRACENE	***51J***	***400U***
BENZO(GHI)PERYLENE	***500***	***210J***
2-METHYLNAPHTHALENE	***2400***	***1300***
DIBENZOFURAN	***1700***	***820***
CARBAZOLE	***600JN***	***400JN***

Data Qualifiers:

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate. The value preceding the "J" is the estimated value.

N=There is presumptive evidence of the presence of the chemical, but the measurement cannot be considered accurate.

Concentrations presented in mg/kg. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

TABLE 4-4

WASTE SAMPLING SUMMARY - DIOXINS/FURANS
CHATTANOOGA CREEK TAR DEPOSIT
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	SAMPLE ID: WS-04
DIOXINS/FURANS	
1,2,3,4,6,7,8 HEPTACHLORODIBENZODIOXIN	***410J***
HEPTACHLORODIBENZODIOXIN (TOTAL)	***860J***
TETRACHLORODIBENZONFURAN (TOTAL)	***1600J***
PENTACHLORODIBENZOFURAN (TOTAL)	***560J***
HEXACHLORODIBENZOFURAN (TOTAL)	***560J***
HEPTACHLORODIBENZOFURAN (TOTAL)	***1200J***
OCTACHLORODIBENZOFURAN (TOTAL)	***960J***
TEQ (TOXIC. EQUIV. VALUE, FROM I-TEF/89)	***14J***

Data Qualifiers:

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate. The value preceding the "J" is the estimated value.

Concentrations presented in ng/kg. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

TABLE 4-5

WASTE SAMPLING SUMMARY - INORGANICS
CHATTANOOGA CREEK TAR DEPOSIT
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

CHEMICAL	SAMPLE ID: WM-04	WM-04 (dup.)
INORGANICS		
ARSENIC	16	9.2
BARIUM	19J	25J
CADMIUM	***1.1***	***1.3***
COBALT	22	2.5J
CHROMIUM	26	20
COPPER	***79***	***82***
NICKEL	25	5.8J
LEAD	35J	47J
SELENIUM	***7.3***	***4.9***
VANADIUM	3.9J	3.5J
ZINC	***110***	69
MERCURY	0.06	***0.34***
ALUMINUM	1100J	1600J
MANGANESE	59	66
CALCIUM	1200J	850J
IRON	2700J	2500J
MAGNESIUM	130	170
SODIUM	***140***	***130***
POTASSIUM	190U	230J
CYANIDE	***8.1J***	***14J***

Data Qualifiers:

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate. The value preceding the "J" is the estimated value.

UJ=The chemical was analyzed for but was not detected. The value is the estimated quantitation limit.

N=There is presumptive evidence of the presence of the chemical, but the measurement cannot be considered accurate.

Concentrations presented in mg/kg. Concentrations printed in bold italicized text are considered to be valid detections of unnatural contamination.

waste sample for a total concentration of 36,451 mg/kg. All of these volatile and semi-volatile organic compounds are common derivatives of coal tar. Seven dioxin/furan compounds were detected. These compounds have a TEQ of 14 ng/kg (see discussion of TEQ in Section 4.3.1). This TEQ is well below the EPA clean-up goal of 1 ug/kg for residential areas.

Seven inorganic constituents were present in the waste sample or its duplicate at concentrations exceeding that of the background surface soil criteria. These chemicals include: cadmium, copper, selenium, zinc, mercury, sodium, and cyanide.

4.3.3 LANDES COMPANY PROPERTY

In August of 1996 two waste samples were collected at the Landes Company property. Both samples, consisted of oily, dark, tar-like material. The samples were collected from spoils piles associated with trenches that had been dug during construction activities. The analytical results of these samples are shown in **Tables 4-6** and **4-7**. Both samples contained an identical suite of VOCs with the maximum concentration occurring in sample WS-06. The VOCs and the maximum concentrations are: benzene (210 mg/kg), toluene (720 mg/kg), chlorobenzene (260 mg/kg), ethylbenzene 21 mg/kg), and total xylene (240 mg/kg). Semivolatile organic compounds detected in one or both samples include naphthalene, fluorene, phenanthrene, 2-methylnaphthalene, dibenzofuran, and carbazole. The total concentration of PAHs in sample WS-06 is 5,300 mg/kg and in sample WS-07 the total PAH concentration is 3,000 mg/kg. No pesticides or PCBs were detected in either sample.

In order to determine which inorganic constituents are present in the waste at concentrations exceeding naturally occurring concentrations, the analytical data from the waste samples were compared to background criteria for subsurface soil. Subsurface soil criteria were selected for comparison to waste because the waste is present below ground surface. As shown in Table 4-6, six metals (arsenic, cadmium, copper, nickel, mercury, and silver) were detected at concentrations exceeding the background criteria for subsurface soil (see Section 5.3.1 for a

TABLE 4-6

WASTE SAMPLING SUMMARY - INORGANICS
LANDES COMPANY PROPERTY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

SAMPLE ID: / CHEMICAL	WM-06	WM-06 (Dup)	WM-07
ARESENIC	***43***	***51***	30
BARIUM	41	41	45
BERYLLIUM	0.63	0.85	0.53
CADMIUM	***3.3***	***2.7***	***1.6***
COBALT	5.8	7.1	42
CHROMIUM	9.3	10	16
COPPER	***480***	***560***	***220***
NICKEL	2.8	3.6	31
LEAD	***2100***	***990***	***100***
SELENIUM	17	15	10U
SILVER	***2.6***	***22***	2.5U
VANADIUM	2.9	4.1	13
ZINC	150	140	110
MERCURY	***1.1***	***0.58***	***0.54***
ALUMINUM	1000	1100	6200
MANGANESE	17	24	170
CALCIUM	770	970	3300
IRON	1600	1800	13000
MAGNESIUM	59	71	540
SODIUM	190	150	84
POTASSIUM	46	99	100
CYANIDE	***32***	***60***	***6.4***

Data Qualifiers:

U=The chemical was analyzed for but not detected. The value preceding the "U" is the minimum quantitation limit.

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate. The value preceding the "J" is the estimated value.

UJ=The chemical was analyzed for but was not detected. The value is the estimated quantitation limit.

Concentrations presented in mg/kg. Concentrations printed in bold italicized text are considered to be valid detections of unnatural contamination.

TABLE 4-7

WASTE SAMPLING SUMMARY - ORGANICS
LANDES COMPANY PROPERTY
TENNESSEE PRODUCTS SITE
CHATTANOOGA, TENNESSEE

SAMPLE ID: / CHEMICAL	WS-06	WS-06 (dup)	WS-07 (dup)
VOLATILE ORGANICS			
BENZENE	***210***	***130***	***27***
TOLUENE	***720***	***380***	***40***
CHLOROBENZENE	***260***	***170***	***18***
ETHYL BENZENE	***21***	***14***	***4***
TOTAL XYLENES	***240***	***170***	***47***
SEMIVOLATILE ORGANICS			
NAPHTHALENE	***1500***	***1000***	***1900***
FLUORENE	***2500***	***2000***	***4200***
PHENANTHRENE	**1000U**	**1000U**	***1500***
2-METHYLNAPHTHALENE	***1300***	**1000U**	***1900***
DIBENZOFURAN	**1000U**	**1000U**	***1000***
CARBAZOLE	***1300***	**1000U**	***1200***

Data Qualifiers:

J=The qualitative analysis of the chemical is acceptable, but the value can not be considered as accurate. The value preceding the "J" is the estimated value.

N=There is presumptive evidence of the presence of the chemical, but the measurement cannot be considered accurate.

Concentrations presented in mg/kg. Concentrations printed in bold italicized text are considered to reflect a valid detection of unnatural contamination.

description of the calculation of the 95% confidence level for background concentrations of metals in subsurface soil). Most notable are the concentrations of lead which was detected in both waste samples (and the duplicate) at concentrations ranging from 220 to 2100 mg/kg. The subsurface background concentration is 79 mg/kg. Concentrations of mercury, copper and cadmium exceeding background concentrations were also detected in all samples. Arsenic and silver were present at concentrations exceeding background concentrations only in sample WS-06. Cyanide was also present in all samples at significant concentrations ranging from 6.4 mg/kg to 60 mg/kg (WS-06 duplicate). The background concentration of cyanide in subsurface soils is 0.1 mg/kg.